

Synthesis and photochemical reactions of iron(II) doped copper ferrites as heterogeneous catalysts

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Extended Abstract

Synthetic dyes and pigments have been widely used for aesthetic purpose, mainly in textile dyeing and printing, food, ink, papermaking, cosmetics and pharmaceutical industries. Synthetic dyes are preferred over natural counterparts because of its brilliant colours and reasonable prices. Among these dyes methylene blue (MB) is considered as hazardous to many living organisms including aquatic lives. Researchers have investigated many treatment methods such as adsorption, Fenton process, biological oxidation, sonochemical and photochemical oxidation to eradicate MB from aqueous medium[1].

Recently heterogeneous ferrite NPs have attracted the researcher's attention in wastewater treatment process, in the photocatalytic degradation of various hazardous compounds [2].

This research work reported the synthesis of magnetic iron(II) doped copper ferrite nanoparticles (NPs) by simple co-precipitation method.

The NPs were synthesized with change in composition of copper and iron(II) given as, $\text{Cu}^{\text{II}}_{(x)}\text{Fe}^{\text{II}}_{(1-x)}\text{Fe}^{\text{III}}_2\text{O}_4$ (where $x = 0.0, 0.2, 0.4, 0.6, 0.8, 1.0$). The samples were characterized by Raman spectroscopy, XRD, SEM, TEM-EDS and particle size analysis. The synthesized NPs were evaluated for photocatalytic activity using methylene blue (MB as the model hazardous dye) in the presence of hydrogen peroxide (as the reagent of Fenton type system). The photocatalytic activities were determined due to the continuously measured UV-visible spectra during the irradiation of MB. The $\text{Cu}^{\text{II}}_{(0.4)}\text{Fe}^{\text{II}}_{(0.6)}\text{Fe}^{\text{III}}_2\text{O}_4$ NPs were observed to be the best among the synthesized NPs. The effects of pH, concentration of NPs and H_2O_2 were investigated on dye degradation; hence, the optimized circumstances were determined for the highest degradation efficiency. It can be concluded based on the photocatalytic results that iron(II) doped copper ferrites will be a new catalyst in wastewater treatment.

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References

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